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Soil Sampling in the City: Growing Green Infrastructure on Chicago's South Side

Feature

SOIL SAMPLING IN THE CITY

GROWING GREEN INFRASTRUCTURE ON CHICAGO'S SOUTH SIDE

By Kelsey Rotwein

On a cold Saturday last December, six DePaul students, two professors and half a dozen teenagers huddled on a vacant lot on Chicago's South Side. They all peered intently at the snow-blanketed ground, which held a wealth of secrets undetectable to the naked eye, including microbial activity, nitrates, electrical currents and salinity levels. Thanks to funding from a competitive U.S. Environmental Protection Agency People, Prosperity and the Planet (P3) $15,000 grant, the group had gathered to work on their yearlong soil testing project. No amount of snow or wind was going to stop them.

The genesis of the project dated to a year earlier, when environmental science and studies faculty members Christie Klimas, assistant professor, and James Montgomery, associate professor, submitted a grant application outlining their vision to test the soil characteristics of several vacant lots, with the goal of determining what types of green infrastructure could thrive in those spaces. Since the lots belong to the Gary Comer Youth Center (GCYC), a community hub that offers extracurricular activities and college readiness programs for youths in the Greater Grand Crossing neighborhood, the proposal aimed to strengthen an existing partnership between the two institutions. "This project is not only about teaching students to test soil," Montgomery explains. "It's about working with an anchor institution in a low-income, minority community to figure out solutions together."

Building on a partnership

The original partnership between DePaul and GCYC consisted primarily of an internship program for DePaul students. During summer 2013, Klimas and Montgomery were able to expand the partnership; with funding from the Vincentian Endowment Fund, they offered a three-week program for a cohort of GCYC's Green Teen students. "It was really fortuitous timing because we got a better sense of what a partnership would look like and what we could offer as a university," Klimas says. To that end, Green Teen students made the daily trek to DePaul's Lincoln Park Campus and various sites around the city to learn about environmental science, conduct soil tests and experience college life. Representatives from admissions, financial aid, mission and values, and other areas of DePaul held informational sessions and answered questions over lunch.

Several of the summer program participants attended the Saturday workshop in December. "It all came back to me," says Travon Q. Washington, a senior at Gary Comer College Prep. "I knew to crush the soil so we could sample it, how to determine what kind of soil it is and how to measure it." Washington and other returning participants not only hit the ground running, but also were able to teach their fellow Green Teens. "Our students found out things they never would have known without the skills they learned at DePaul," says Marji Hess, the garden manager at GCYC.

Ellen Webb and Yarency Rodriguez grind and sieve soil samples in one of the College of Science and Health's labs.

Katherine Vollrath, Allison Williams, James Montgomery, Yarency Rodriguez and Christie Klimas gather at the GCYC's rooftop garden.

Webb and Rodriguez determine soil texture and the presence of calcium carbonate in soil core from a lot on Chicago's South Side.

"A lot of people come to this community and only see the deficits. DePaul came to us and saw the assets, and they helped our young people to see them, too."

Senior Yarency Rodriguez, one of six DePaul students who worked on the P3 grant project, grew up on the Southwest Side. "I couldn't believe it when I heard DePaul was planning to conduct a soil assessment and green infrastructure project in my area of the city," she says. "Usually it's only the North Side that gets credit for being beautiful and welcoming." Along with fellow seniors Christian DeKnock, Katherine Vollrath and Ellen Webb, plus junior Allison Williams and recent graduate Kathryn Rico (CSH '13), Rodriguez became an expert at testing soil characteristics in the lots and analyzing the results.

Soil sampling, analysis and conclusions

Collecting the soil samples was an arduous process. The P3 students made field trips to vacant lots on the South Side for several weeks throughout the fall quarter, culminating in the December workshop. Using a 6-foot-tall auger tipped with razors, the students dug deep into the dirt. "We'd get the auger down 12 inches, but then we'd hit concrete and rubble because there used to be a house there," Webb says. "More times than not, we'd have to move to another spot and try again." All told, the students collected 116 soil samples to analyze in the lab.

Vollrath focused on determining the level of microbial activity in the samples. "Microbes are little organisms that live in the soil, and they tell you how fertile or 'alive' the soil is," she explains. Using readings of carbon dioxide from sealed jars of soil mixed with water, Vollrath discovered low levels of microbial activity in the lot. "It's an issue because without microorganisms, organic material cannot be broken down and utilized by plants," she says. "But the good news is that there are ways to fix that." Vollrath points to composting as one possible solution, and it's especially feasible because the Green Teens already practice composting in their rooftop garden.

While the P3 team conducted some soil tests directly on the lots, most of the tests required extended periods in the lab. Over winter break, the students routinely worked for seven-hour stretches or longer. "You have to do a lot of the

tests for several hours, so it's hard when school is in session," explains Williams. "For the lead test, you're heating up the soil and adding acid and hydrogen peroxide to it every 30 minutes for several hours." The students then filtered the liquid out of the soil to test it for lead.

The students found total lead concentrations ranging from a few parts per million to more than 1,000 parts per million and are now looking into the levels of ingestible lead. "When there are high total lead levels but not high ingestible lead levels, it's not as much of a concern," Webb says. A low ingestible lead level means the community could grow edible plants on the lot without fear of consuming harmful quantities of the metal. Even if the levels of ingestible lead are too high, all is not lost. The community could potentially counteract this problem by planting certain types of plants that absorb lead, such as sunflowers, Indian mustard or blue fescue.

Other soil tests revealed a number of potential problems that will require remediation to make the soil capable of sustaining plant life. For example, the soil's pH levels ranged from 8.3 to 8.6, but plants grow best in pH levels of 6 to 7. "You can change it chemically by using peat," Webb asserts, "or you could even add sulfur or coal dust to try to mitigate some of the effects of the high pH." The team also discovered very low levels of nitrates. "You need 10 parts per million to grow plants, and we were well below that," Williams shares. "A lot of nitrates get into the soil through microbes, so that's one of the remediation strategies."

Presentations and next steps

In late April, the P3 team presented their results at the Environmental Protection Agency's National Sustainable Design Expo in Washington, D.C. The annual event brings together all of the P3 award winners, plus government agencies, nonprofit organizations and businesses, for three days of exhibitions, demonstrations and idea sharing. "We had a poster and video, and the students made beautiful geographic information system soil maps on nitrates, phosphate, lead and microbial activity," Klimas says. They also brought a soil quality test kit to teach visitors about their experiments. Thousands of interested citizens attended the expo, giving new exposure to the DePaul team's project, which received an honorable mention at the awards ceremony on the final day.

As the original project draws to a close, the legacy of the first P3 team will live on in a new group of students who will extrapolate from the team's results as they determine green infrastructure possibilities. Depending on the wants and needs of the community, as well as which types of infrastructure would make the most sense in terms of the existing soil quality, the lot may eventually feature a community garden, fountains, restored prairie, orchards or something else entirely. "This is just the starting point for a conversation in the community," Klimas says. "It was a natural fit for us because it involved service-based learning and using the knowledge our students acquired in class over the past few years."

The team unanimously agrees with Klimas' assessment. "I have definitely grown as a science scholar," Rico says. "I just think it's immensely important to have undergraduate research opportunities, particularly in the environmental sciences, where projects such as this one can have a huge impact on our surrounding communities." Williams asserts that "this project has prepared me for my professional goals more than I could have imagined," and Vollrath concurs, saying, "I'm interested in sustainable food production. I didn't know anything about soil before, and now I realize that it's pretty important for what I want to do." The impact of this project goes beyond just the science the students are learning. "I've learned better communication skills throughout this process," Webb says. "I had to know all my data and its implications and be able to explain it to others."

Long before sustainability and community outreach became mainstream terms, DePaul's namesake put those concepts into practice. "St. Vincent de Paul ran a farm in France where he raised livestock, recycled manure and grew the food he used to feed the poor," Montgomery says. "Our P3 team carried out the mission of St. Vincent de Paul in a very tangible and real way." GCYC's garden manager sees a similar connection with her institution's namesake. "Gary Comer always said that the best is yet to come," Hess notes. "You can see that vision in our sustained partnership with DePaul."

From Asparagus to Zucchini Squash: GCYC's Green Teens

Founded in the summer of 2009, the Green Teens program at the Gary Comer Youth Center offers local youths the opportunity to learn about environmental and agricultural careers while making a positive impact on their community. Green Teen participants join one of three cohorts focused on careers in agriculture, business and the culinary arts, committing to 15 hours of involvement per week during the school year and 20 hours per week in the summer. Each of the three groups helps to grow, maintain, harvest, distribute and, of course, consume the organic produce grown in four GCYC gardens.

In the 8,600-square-foot rooftop garden, the Green Teens care for more than 300 varieties of perennials and annuals, yielding 1,000 pounds of produce annually. The crop includes such items as asparagus, blueberries, herbs, potatoes, strawberries, tomatoes and zucchini squash. As the Green Teens learn to become good stewards of the earth, they also gain valuable skills in teamwork, communication, collaboration and leadership. Since 2010, 425 youths have participated in the Green Teens program. Currently, 85 youths ages 13 to 18 are in the program.

ONLINE EXTRAS

Watch a short video the P3 team created about their project at *bit.ly/depaulP3.*